

REMARKS

This Amendment is submitted in response to the final Office Action mailed on August 10, 2009. A Request for Continued Examination ("RCE") (\$810.00) is submitted herewith. The Director is authorized to charge \$810.00 for the RCE and any additional fees which may be required, or to credit any overpayment to Deposit Account No. 02-1818. If such a withdrawal is made, please indicate the Attorney Docket No. 3712174-00037 on the account statement.

Claims 26-37 are pending in this application. Claims 1-25 were previously canceled without prejudice or disclaimer. In the Office Action, Claims 35 and 37 are rejected under 35 U.S.C. §112. Claims 26-37 are rejected under 35 U.S.C. §103. In response, Claims 26 and 37 have been amended, Claim 33 has been canceled and Claims 38-39 have been newly added. The amendments do not add new matter. The new claims do not add new matter. At least in view of the amendments and/or for the reasons set forth below, Applicants respectfully submit that the rejections should be withdrawn.

In the Office Action, Claim 35 is rejected under 35 U.S.C. §112, first paragraph, for failure to comply with the enablement requirement. The Patent Office asserts that, while being enabling for a solvent comprising propylene carbonate, ethylene carbonate and γ -butyrolactone, the present Specification fails to enable one skilled in the art to make or use a solvent comprising propylene carbonate, ethylene carbonate and methyl ethyl carbonate and/or dimethyl carbonate. See, Office Action, page 2, lines 10-17. In response, Applicants note that paragraph 52 of the Specification states: "To this mixture system can also be added other non-aqueous solvent(s), such as γ -butyrolactone. In the propylene carbonate-ethylene carbonate mixture system, the content of propylene carbonate is preferably 10 mol % to 75 mol %." See, Specification, page 4, paragraph 52 (emphasis added). One of ordinary skill in the art would understand that the phrase "such as" indicates γ -butyrolactone is merely one example of a non-aqueous solvent that may be used in addition to propylene carbonate and ethylene carbonate, rather than the only non-aqueous solvent that may be used with propylene carbonate and ethylene carbonate. The Specification further describes non-aqueous solvents as including γ -butyrolactone, ethyl methyl carbonate and dimethyl carbonate. See, Specification, page 1, paragraph 12. Thus, Applicants respectfully submit that the Specification would enable one skilled in the art to make a solvent comprising propylene carbonate, ethylene carbonate and methyl ethyl carbonate and/or dimethyl carbonate.

Accordingly, Applicants respectfully request that the rejection of Claim 35 under 35 U.S.C. §112, first paragraph, be withdrawn.

In the Office Action, Claim 37 is rejected under 35 U.S.C. §112, second paragraph, as being indefinite. The Patent Office asserts that the phrase “not less than 35 mol %” is indefinite because it includes values greater than 75 mol %. See, Office Action, page 2, lines 18-22; page 3, lines 1-2. In response, Applicants have amended Claim 37 to recite that the content of propylene carbonate is “between 35 mol% and 75 mol %.” This amendment does not add new matter. The amendment is supported in the Specification at, for example, page 4, paragraph 52, lines 7-11; paragraph 67, lines 1-2.

Accordingly, Applicants respectfully request that the rejection of Claim 37 under 35 U.S.C. §112, second paragraph, be withdrawn.

In the Office Action, Claims 26-37 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,772,934 to MacFadden (“*MacFadden*”) in view of U.S. Patent No. 5,522,127 to Ozaki et al. (“*Ozaki*”). In response, Applicants have amended Claim 26. In view of the amendment and/or for at least the reasons set forth below, Applicants respectfully submit that the cited references are deficient with respect to Claims 26-37.

Currently amended independent Claim 26 recites, in part, a gel electrolyte secondary cell comprising: a positive electrode; a negative electrode comprising a current collector and a powder mixture composed of a graphite material classified by particle size adjustment to have a mean particle size of 5 to 100 μm ; and a gel electrolyte comprising an electrolyte salt, a non-aqueous solvent and a high-molecular weight material, wherein the non-aqueous solvent comprising propylene carbonate and ethylene carbonate, and wherein a content of propylene carbonate ranges from 10 mol% to 75 mol%. This amendment does not add new matter. The amendment is supported in the Specification at, for example, page 2, paragraph 34, lines 6-7; page 3, paragraph 36, lines 1-5. In contrast, Applicants respectfully submit that the cited references are deficient with respect to Claims 26-37.

For example, the cited references fail to disclose or suggest a graphite material classified by particle size adjustment to have a mean particle size of 5 to 100 μm (e.g., a material that is not ground) as required, in part, by independent Claim 26. The Patent Office admits that *MacFadden* fails to teach a graphite material having the claimed particle size and instead relies on *Ozaki* for the claimed element. See, Office Action, page 4, lines 6-15. However, *Ozaki* is entirely directed to a negative electrode containing pulverized mesophase carbon micro beads. See, *Ozaki*, Abstract, lines 4-7; column 3, lines 26-67. In fact, *Ozaki* teaches that adding a pulverizing process to its mesophase graphite particles “leads to smooth intercalating of lithium

at charging over a wide temperature range resulting in an increased cell capacity.” See, *Ozaki*, column 3, lines 8-14.

One of ordinary skill in the art would understand that when ground or pulverized, the edges of the crystalline of graphite are exposed to the surface and lead to the degradation of propylene carbonate. In contrast, by providing the graphite in an unground form as further defined in new Claim 39 and instead classifying the material by particle size adjustment, the secondary cell of the present claims reduces the amount of graphite exposed to the surface and avoids the degradation of propylene carbonate, thereby suppressing impedance and improving the discharge capacity and efficiency. However, *Ozaki* is entirely unconcerned with the degradation of propylene carbonate, since it specifically teaches away from using propylene carbonate as a solvent with its mesophase graphite particles: “As for the organic solvent of the organic electrolyte for the non-aqueous electrolyte, propylene carbonate (PC) is not employed, because it decomposes to generate a gas [at] during charging.” See, *Ozaki*, column 7, lines 5-8. Nowhere does *Ozaki* disclose or even suggest that its mesophase carbon micro beads are classified to have the claimed mean particle size (e.g., not ground) as further defined in new Claim 39. As such, Applicants respectfully submit that *Ozaki* and, thus, the cited references at least fail to disclose the claimed graphite material.

Moreover, one of ordinary skill in the art would have no reason to combine the cited references to arrive at the present claims because *Ozaki* teaches away from using its mesophase carbon particles with a propylene carbonate solvent as required by the present claims. References must be considered as a whole and those portions teaching against or away from each other and/or the claimed invention must be considered. *Bausch & Lomb, Inc. v. Barnes-Hind/Hydrocurve Inc.*, 796 F.2d 443 (Fed. Cir. 1986). “A prior art reference may be considered to teach away when a person of ordinary skill, upon reading the reference would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the Applicant.” *Monarch Knitting Machinery Corp. v. Fukuhara Industrial Trading Co., Ltd.*, 139 F.3d 1009 (Fed. Cir. 1998), quoting, *In re Gurley*, 27 F.3d 551 (Fed. Cir. 1994) (emphasis added).

Ozaki teaches that “propylene carbonate (PC) is not employed” as a solvent with its micro beads “because [PC] decomposes to generate a gas [at] during charging.” See, *Ozaki*, column 7, lines 5-8. *Ozaki* further teaches that propylene carbonate is undesirable for use with its micro beads because it has unfavorable side reactions. See, *Ozaki*, column 7, lines 8-11.

The Patent Office asserts that Applicants' argument that *Ozaki* teaches away from propylene carbonate has been addressed by the Board of Patent Appeals and has been determined to be non-persuasive. See, Office Action, page 9, lines 1-3. However, Applicants respectfully submit that this mischaracterizes the basis for the Board's decision. In the Examiner's Answer submitted to the Board of Patent Appeals, the Examiner argued that Applicants' teaching away argument was not persuasive because "Ozaki is not applied to teach the electrolyte of the instant claims. . . . One of skill would be motivated to use the negative electrode of Ozaki for the negative electrode of Akashi because Akashi clearly suggests a negative electrode comprising a graphitized carbonaceous material." See, Examiner's Answer, page 5, lines 19-22; page 6, lines 1-2. The Board of Patent Appeals agreed with the Examiner that "Akashi, not Ozaki, discloses the use of propylene carbonate as an organic solvent." See, Board Decision, page 5, lines 8-9. However, this portion of Board's decision merely suggests that *Ozaki* is not necessary to show the required element of a solvent containing propylene carbonate. The Board never addressed whether *Ozaki* teaches away from the use of propylene carbonate. In fact, the Board expressly stated that "appellants have not demonstrated why one of ordinary skill in the art would have been dissuaded from using the carbonaceous material of Ozaki for the negative electrode of Akashi." See, Board Decision, page 5, lines 9-12.

Applicants respectfully submit that the Patent Office has applied hindsight reasoning and failed to consider *Ozaki* as a whole, including those portions of *Ozaki* teaching away from the present claims. Regardless of whether the Patent Office is relying on *Ozaki* for the claimed electrolyte solvent or whether *MacFadden* suggests using a negative electrode comprising a graphitized carbonaceous material, the Patent Office must consider *Ozaki* as a whole, including those portions of *Ozaki* that teach away from the claims. The present claims recite a negative electrode comprising a graphite material classified by particle size adjustment to have a mean particle size of 5 to 100 μm (e.g., not ground as further defined in new Claim 39); and a gel electrolyte comprising a non-aqueous solvent including propylene carbonate and ethylene carbonate. Therefore, the present claims recite the claimed graphite material being used in combination with a solvent containing propylene carbonate. In stark contrast, as discussed previously, *Ozaki* teaches that propylene carbonate is not used as a solvent with its mesophase carbon micro beads. See, *Ozaki*, column 7, lines 5-11. Therefore, one of ordinary skill in the art would have been discouraged from using the mesophase carbon micro beads of *Ozaki* with a propylene carbonate solvent as required by the present claims.

In the Examiner's Answer submitted to the Board of Patent Appeals, the Examiner also urged that "[i]t is important to point out that the Ozaki reference teaches propylene carbonate is not favorable as the only solvent. The claims only require as little as 10 mol% propylene carbonate." See, Examiner's Answer, page 6, lines 6-8. However, contrary to the Examiner's assertion, *Ozaki* teaches that ethylene carbonate is not favorable as the only solvent, whereas propylene carbonate is not suitable at all in the solvent:

As for the organic solvent of the organic electrolyte for the non-aqueous electrolyte, ***propylene carbonate (PC) is not employed***, because it decomposes to generate a gas [at] during charging. On the other hand, ***ethylene carbonate (EC) used alone is not suitable***, since it has a high melting temperature and is solid at ordinary temperature, ***though it has no unfavorable side reaction, as of PC***. However, ***EC may be used in a mixed solvent*** of EC and either ether such as 1,2 dimethoxyethane, chain carbonate such as diethyl carbonate, ethyl methyl carbonate, or aliphatic-carboxylic acid ester such as methyl propionate, which are of low melting temperature and of low viscosity.

Ozaki, column 7, lines 5-16 (emphasis added). The Board relied on the Examiner's mischaracterization of *Ozaki* in its evaluation of the combinability argument. See, Board Decision, page 5, lines 12-18. However, as discussed previously, *Ozaki* teaches that propylene carbonate is not used at all as a solvent with its mesophase carbon micro beads. See, *Ozaki*, column 7, lines 5-11. As such, Applicants respectfully submit that one of ordinary skill in the art would have no reason to combine the mesophase carbon micro beads of *Ozaki* with the electrolyte of *MacFadden* to obtain a secondary cell including: (1) a negative electrode comprising a graphite material classified by particle size adjustment to have a mean particle size of 5 to 100 μm (e.g., not ground as further defined in new Claim 39); and (2) a gel electrolyte comprising a non-aqueous solvent including propylene carbonate as required by the present claims because *Ozaki* teaches away from using its carbon micro beads with a solvent containing any propylene carbonate.

Accordingly, Applicants respectfully request that the rejection of Claims 26-37 under 35 U.S.C. §103(a) to *MacFadden* and *Ozaki* be withdrawn.

In the Office Action, Claims 26-37 are rejected under 35 U.S.C. §103(a) as being unpatentable over European Patent No. 0724305 B1 to Akashi ("*Akashi*") in view of *Ozaki*. In response, Applicants have amended Claim 26. In view of the amendment and/or for at least the reasons set forth below, Applicants respectfully submit that the cited references are deficient with respect to Claims 26-37.

For example, the cited references fail to disclose or suggest a graphite material classified by particle size adjustment to have a mean particle size of 5 to 100 μm (e.g., not ground as further defined in new Claim 39) as required, in part, by independent Claim 26. The Patent Office admits that *Akashi* fails to teach a graphite material having the claimed particle size and instead relies on *Ozaki* for the claimed element. See, Office Action, page 6, lines 11-22; page 7, lines 1-5. However, as discussed previously, *Ozaki* is entirely directed to a negative electrode containing pulverized mesophase carbon micro beads and fails to disclose or suggest that its micro beads are classified by particle size adjustment (e.g., not ground as further defined in new Claim 39). See, *Ozaki*, Abstract, lines 4-7; column 3, lines 8-14 and 26-67. Thus, Applicants respectfully submit that the cited references at least fail to disclose the claimed graphite material.

Moreover, for reasons discussed previously, one of ordinary skill in the art would have no reason to combine the cited references to arrive at the present claims because *Ozaki* teaches away from using its mesophase carbon particles with a solvent containing propylene carbonate. Regardless of whether the Patent Office is relying on *Ozaki* for the claimed electrolyte solvent or whether *Akashi* suggests using a negative electrode comprising a graphitized carbonaceous material, the Patent Office must consider *Ozaki* as a whole, including those portions of *Ozaki* that teach away from the claims. The present claims recite the claimed graphite material being used in combination with a solvent containing propylene carbonate. In stark contrast, as discussed previously, *Ozaki* teaches that propylene carbonate is not used as a solvent with its mesophase carbon micro beads. See, *Ozaki*, column 7, lines 5-11. Therefore, even if *Akashi* provides a suggestion for using the graphite material of *Ozaki* in its secondary cell, one of ordinary skill in the art would have nevertheless been discouraged from using the mesophase carbon micro beads of *Ozaki* with a propylene carbonate solvent as required, in part, by the present claims.

Accordingly, Applicants respectfully request that the rejection of Claims 26-37 under 35 U.S.C. §103(a) to *Akashi* and *Ozaki* be withdrawn.

Applicants further note that Claims 38-39 have been newly added. The new Claims are fully supported in the Specification at, for example, page 2, paragraph 34; page 3, paragraph 36; page 4, paragraph 64; page 6, paragraph 84. No new matter has been added thereby. Applicants respectfully submit that the subject matter as defined in the newly added claims is patentable over the cited art for at least substantially the same reasons as discussed above.

With respect to Claim 38, the cited references fail to disclose that the powder mixture of the negative electrode comprises a polyvinylidene fluoride binder. *Ozaki* fails to disclose the use of a polyvinylidene fluoride binder with its graphite material and instead teaches that its mesophase graphite particles are mixed with styrene butadiene rubber. See, *Ozaki*, column 4, lines 6-10. One of ordinary skill in the art would understand that styrene butadiene rubber exerts a binding effect by its sticky property and is more effective when used to bind particles having a rough surface such as the pulverized particles of *Ozaki*. In contrast, polyvinylidene fluoride is desirable when unground particles are used because it exerts a binding effect with little volume among particles with a rather smooth surface. Therefore, the cited references fail to disclose or suggest a negative electrode which comprises the claimed graphite particles and a polyvinylidene fluoride binder as required, in part, by Claim 38.

For the foregoing reasons, Applicants respectfully submit that the present application is in condition for allowance and earnestly solicit reconsideration of same.

Respectfully submitted,

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